

CLAIMS

WHAT IS CLAIMED IS:

1. A method of analyzing one or more contents of a sealed consumables container, the method comprising:
 - providing an NMR spectrometer and an NMR probe configured to accept a portion of the sealed consumables container;
 - positioning the portion of the container within a data collection region of the NMR probe;
 - establishing a homogeneous static magnetic field across the data collection region;
 - collecting an NMR spectrum; and
 - analyzing one or more peaks in the NMR spectrum, thereby analyzing one or more contents of the sealed consumables container.
2. The method of claim 1, wherein the sealed consumables container comprises a bottle of wine.
3. The method of claim 1, wherein the sealed consumables container comprises a container of nonalcoholic beverage, alcoholic beverage, beer, vinegar or olive oil.
4. The method of claim 1, wherein the sealed consumables container holds comprises a food or beverage container, wherein the contained food or beverage comprises components having sharply defined NMR peaks.
5. The method of claim 1, wherein analyzing the container comprises determining a presence or a concentration of a selected component of the contents.
6. The method of claim 5, wherein the selected component comprises acetic acid.
7. The method of claim 5, wherein the selected component comprises one or more aldehydes.
8. The method of claim 5, wherein the selected component comprises one or more flavenoids.
9. The method of claim 1, wherein positioning the portion of the container comprises placing a neck of the container within the data collection region of the NMR probe.
10. The method of claim 1, wherein positioning the portion of the container comprises placing a body of the container within the data collection region of the NMR probe.

11. The method of claim 1, wherein the NMR spectrometer further comprises one or more shim coils, and wherein establishing the homogeneous static magnetic field across the data collection region comprises adjusting the one or more shim coils.
12. The method of claim 1, wherein analyzing the one or more peaks comprises performing integration on the one or more peaks.
13. An NMR probe configured to position a portion of a sealed consumables container within an NMR spectrometer, the probe comprising:
 - a body structure having a cavity disposed at a first end of the body structure, said cavity being adapted for receiving a portion of the sealed container;
 - a first rf coil positioned proximal to the cavity and the portion of the sealed container; and
 - a tuning capacitor coupled at a first position to the rf coil and coupled at a second position to a length of coaxial cable configured for connection to the NMR spectrometer.
14. The NMR probe of claim 13, wherein the probe comprises a ^1H probe.
15. The NMR probe of claim 13, wherein the probe comprises a ^2H probe.
16. The NMR probe of claim 13, wherein the probe comprises a ^{13}C probe.
17. The NMR probe of claim 13, wherein the probe comprises a ^{17}O probe.
18. The NMR probe of claim 13, wherein the first rf coil comprises 12 gauge copper wire wound as an eight turn 1 cm diameter split solenoid coil.
19. The NMR probe of claim 18, wherein the first rf coil comprises a first coil portion having 4 turns of copper wire positioned at a first side of the cavity, and a second coil portion having 4 turns of copper wire and coupled to the first coil portion by a copper connecting wire, wherein the second coil portion is positioned on an opposite side of the cavity and along a same axis as the first coil portion, whereby the two coil portions encompass the portion of the sealed container.
20. The NMR probe of claim 18, wherein the first rf coil comprises a birdcage-style coil.
21. The NMR probe of claim 13, wherein the first rf coil comprises a coil used for both transmitting and receiving rf pulses.
22. The NMR probe of claim 13, further comprising a second rf coil positioned distal to the first rf coil.

23. The NMR probe of claim 22, wherein the second rf coil is configured for measurement of one or more signals from a calibration sample.
24. The NMR probe of claim 22, wherein the second rf coil is configured for selective excitation of a heteronucleus.
25. The NMR probe of claim 23, wherein the heteronucleus comprises ^{13}C , ^{17}O , ^2H , ^{23}Na , ^{27}Al , ^{199}Hg , or ^{207}Pb .
26. The NMR probe of claim 13, further comprising components for generating one or more magnetic field gradients, wherein the components are coupled to the body structure.
27. The NMR probe of claim 26, wherein the components for generating one or more magnetic field gradients comprise imaging components.
28. The NMR probe of claim 13, wherein the portion of the sealed consumables container comprises a neck of the container.
29. The NMR probe of claim 13, wherein the portion of the sealed consumables container comprises a body of the container.
30. The NMR probe of claim 13, further comprising a tuning capacitor coupled to the first rf coil, wherein the tuning capacitor comprises one or more non-magnetic 0 – 10 picofarad high power rf capacitors.
31. The NMR probe of claim 13, further comprising a calibration fluid sample tube positioned within the cavity of the body structure and adjacent to the portion of the sealed consumables container when the container is inserted in the cavity.
32. The NMR probe of claim 13, further comprising a fluid jacket for modulating a temperature of the probe.
33. A system for analyzing contents of a sealed consumables container, comprising:
the NMR probe of claim 13;
an NMR spectrometer comprising a body structure, a magnet housed within the body structure, a bore proximal to the magnet and configured to receive the NMR probe, thereby positioning a portion of the container within a magnetic field generated by the magnet, and an amplifier configured for coupling to a first position on the NMR probe; and
a receiver system configured for electronic communication with the NMR probe, the receiver system comprising a preamplifier configured for coupling to a second position on the NMR probe and a detector in communication with the preamplifier.

34. The system of claim 33, wherein the NMR probe comprises a single resonance probe selected from the group consisting of a ^1H probe, a ^2H probe, a ^{13}C probe, an ^{17}O probe, a ^{23}Na probe, a ^{27}Al probe, a ^{199}Hg probe, and a ^{207}Pb probe.
35. The system of claim 33, wherein the first rf coil of the NMR probe comprises a coil used for both transmitting and receiving rf pulses.
36. The system of claim 33, wherein the NMR probe further comprises a second rf coil.
37. The NMR probe of claim 36, wherein the second rf coil is configured for measurement of one or more signals from a calibration sample.
38. The system of claim 33, wherein the portion of the sealed consumables container comprises a neck of the container.
39. The system of claim 33, wherein the portion of the sealed consumables container comprises a body of the container.
40. The system of claim 33, wherein the magnet comprises a room temperature superconducting magnet.
41. The system of claim 33, wherein the magnetic field comprises a 2.01 T magnetic field.
42. The system of claim 33, wherein the receiver comprises a passive rf duplexer and signal mixing and digitization electronics.
43. The system of claim 33, further comprising an NMR pulse programmer.